Saskatchewan Ministry of Agriculture

CROP PRODUCTION NEWS

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CROP PRODUCTION

PRODUCTION

Editor's Comments

By Faye Dokken, Crops Branch

Crops are still quite far behind schedule, but harvest is slowly getting underway in Saskatchewan, despite some recent untimely rain and cool weather. Just over three per cent of the 2009 crop has been combined, according to the August 27 Saskatchewan Agriculture Crop Report (available at www.agriculture.gov.sk.ca/Crop-Report).

What better way to continue to scout your crop than from the combine! With a birds-eye view, take note of any unusual damage or growth patterns, weed issues or yield changes in the crop. Are you happy with the results or your integrated pest management strategy? Now is the time to start thinking about what you may do differently next year in terms of crop rotation and management, and this may be your best chance before the snow flies to identify any last-minute issues that may affect your decisions.

This edition of the Crop Production News highlights some of the issues that may arise during a relatively late, moist harvest. Diseases such as stemphylium blight, botrytis grey mould, and sclerotinia have been identified in some lentil-growing areas recently. Clouds of spores may be visible when combining these crops or any that have been afflicted by saprophytes (fungal scavengers that feed on dead plant material) due to moist conditions being received after the crop has begun to ripen. Storage recommendations must also be heeded. If any crops are going into the bin at higher-than-ideal moisture levels, they will require aeration to prevent deterioration and spoilage.

NOTE: Throughout this document, you will see that some publications are in blue font and underlined, indicating links to website information. If you are reading this off your computer screen, press the CTRL button and click your cursor on the link to take you directly to the website. ✿

Crop Production News is a biweekly publication prepared primarily by provincial specialists with the Crops Branch of the Saskatchewan Ministry of Agriculture. It is a compilation of articles related to entomology, plant pathology, weed science, soils and agronomy issues.

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Crop Protection Lab Update

By Philip Northover, Supervisor, Crop Protection Laboratory

The 2009 growing season has been an unusual one, as demonstrated by the volume and variety of submissions received at the Crop Protection Lab. The majority of samples that have been submitted over the last two weeks have come from pea and lentil plants, but we have also received a significant number from barley, mustard, canola, flax, camelina, dogwood, grape and tomato plants as well as Amur maple.

By far the most frequently diagnosed disease in the past two weeks has been stemphylium leaf blight of lentils. Refer to page four for an article on this disease.

The Dutch Elm Disease (DED) survey collected another 164 samples since the last report, bringing the total for the year to 343 samples, 188 of which have been positively diagnosed as DED.

The other disease submissions we received over the past two weeks have all been associated with the damp, cool weather. Late blight (*Phytophthora infestans*) was found on a tomato sample. This disease can be devastating to tomatoes and especially to potatoes. Under ideal conditions, the disease can develop in as little as five days after infection, and can cause substantial losses by destroying vines and tubers. Fungicide applications in conjunction with sanitation are critical to manage this problem.

White rust (*Albugo candida)* and downy mildew (*Hyaloperonospora parasitica*) were both detected on a camelina plant (Figure 1). These pathogens can affect most brassica crops, notably canola and mustard, as well as cruciferous weeds.

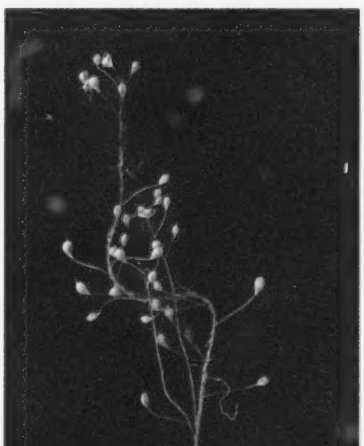

Figure 1: White rust on Camelina. Source: Saskatchewan Agriculture

A number of races of white rust exist, each of which are specific to certain hosts. Infected plants will usually have a kink in their stems, and, in severe cases, the stems and flowers can be distorted. Swollen and deformed flowers and pods, resembling antlers, have given this disease the alternate name of 'staghead'. Stagheads are often covered with white rust pustules containing powdery spore masses, and seed production may be reduced. Resistant cultivars have greatly reduced the impact of this disease on canola. Its impact on camelina is less certain.

A different downy mildew (*Peronospora destructor*) was diagnosed on an onion sample. This disease is very rare in Saskatchewan, but the recent moist and cool weather created ideal conditions for disease development. The disease can greatly reduce the yield and size of onions.

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Crop Protection Lab Update

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Another relatively uncommon disease diagnosed at the lab is tar spot of Amur maple (*Rhytisma acerinum*). This disease has the perfect name, as it is quite distinctive (Figure 2). There is generally no need to be concerned about the disease, although it is unsightly. Removing the infected leaves after they have dropped in the fall is the best approach to managing this disease.

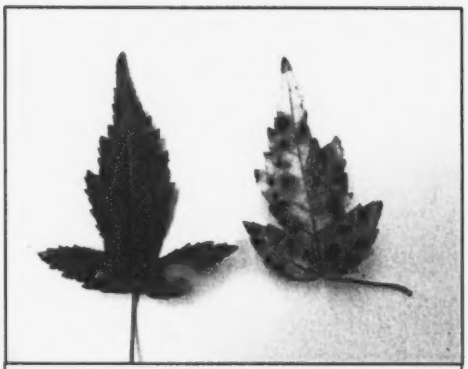

Figure 2: Tar spot of Amur maple.
Source: Saskatchewan Agriculture

Finally, a wet year would be incomplete without at least one sample of white mould/stem rot (*Sclerotinia sclerotiorum*) (Figure 3). A severe infestation was found in a sample of lentils. Destruction of the stems and leaves was significant on this sample, and sclerotia were developing (Figure 4). White mould is primarily a disease of broadleaf crops. If a severe outbreak causes significant losses in one year, it would be advisable to plant a cereal crop in the next, as this fungus can survive for at least a year and usually longer away from a host plant. As with any disease, it is best to manage white mould early, as it can explode under the right conditions.

Figure 3: Sclerotinia on lentils near Davidson, August 2009.
Source: Saskatchewan Agriculture

It is also time to thank Brianna Brown, our summer student, who did a great job of managing the DED diagnoses, and helping out with many other duties around the laboratory. Brianna will be returning to the University of Saskatchewan in September, and we wish her well in her studies.☼

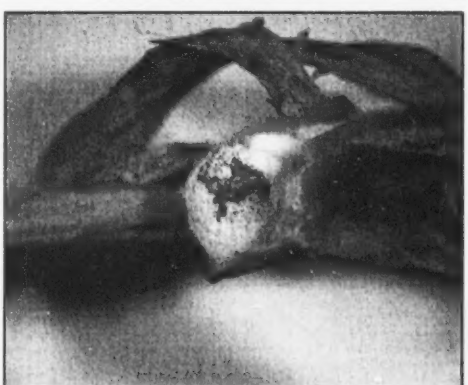

Figure 4: Sclerotium forming on lentil sample at the Crop Protection Lab, 2009.
Source: Saskatchewan Agriculture

Rising to the Top: Stemphylium Blight of Lentils

By Philip Northover, Supervisor, Crop Protection Laboratory and Faye Dokken, Provincial Specialist, Plant Diseases

Plant diseases are a major constraint on pulse production around the world, and lentils in Saskatchewan are no exception. We are making progress against two lentil diseases, anthracnose and ascochyta, through the introduction of resistant varieties and the proper use of effective fungicides, but, under the right selection pressure and environmental conditions, new pathogens appear, giving rise to new problems. For example, stemphylium blight of lentil has appeared occasionally in recent years, including 2009, whenever the environmental conditions are right. But is stemphylium blight really a problem?

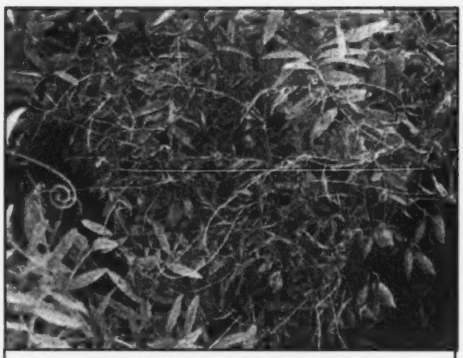

Figure 5: Stemphylium blight on lentils near Yellow Grass, 2009.
Source: Saskatchewan Agriculture

Disease Diagnosis

On lentil, stemphylium blight initially appears as small, light beige lesions on the leaves/leaflets. While the disease is most readily apparent when blighted leaves are noticed at the top of the canopy, it is likely present under the canopy as well. Eventually, smaller lesions coalesce to produce larger, irregularly shaped lesions that can kill entire leaflets and branches. Prolonged moist periods promote further infections and give the upper canopy a grey-brown appearance. Infected leaflets may fall to the ground, and serve as a source of spores for future infections of a wide range of plants. When examined through a hand lens or microscope, older lesions will appear dark brown and fuzzy (due to fungal spore production), and leaves will be twisted and rolled, as they have been desiccated by the pathogen (Figure 5).

Stemphylium spp. are common saprophytes, but, under the right conditions and in the presence of a susceptible host, these species will take advantage of the opportunity to behave as a pathogen on a wide range of crops. Often (but not always), *Stemphylium* spp. will exploit a predisposing factor, such as frost, heat or chemical damage, or even another pathogen that caused damage initially. *Stemphylium botryosum* is generally considered to be the culprit in lentil infections; however, little is known about the host specialization. As growers become more aware of stemphylium blight, it is more likely to be recognized, but we still don't know if the disease is causing significant yield losses, or simply occurring at a time when leaf-drop encourages the crop to dry down and expedite harvest. While the fungus may be damaging the plant, it can be difficult to provide a definitive answer to the common question, "why did this happen this year?"

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Rising to the Top: Stemphylium Blight of Lentils
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Disease Impact and Management

It is generally believed that stemphylium blight is on the rise in Saskatchewan, and this has warranted further research to determine the extent of the potential problem and what can be done about it. In 2007, stemphylium blight was relatively severe and widespread after a dry-but-relatively-humid growing season. However, in 2008, the disease was observed in less than a quarter of the lentil crops surveyed in Saskatchewan, with trace average incidence overall (see the Canadian Plant Disease Survey at www.cps-scp.ca/cpds.shtml). Isolated incidences of the disease were also identified through Crop Protection Laboratory submissions and other inquires in 2008. This year, the lab has received several submissions, and Ministry agrologists and the Agriculture Knowledge Centre have taken numerous calls on the subject.

As with other plant diseases, temperature and moisture are critical factors in stemphylium blight infection and development. Preliminary research at the University of Saskatchewan has shed some light on the epidemiology of the disease in this climate. *Stemphylium botryosum* prefers warm temperatures (above 25°C), and a minimum of eight hours of leaf wetness for optimal disease development on lentils; however, the pathogen can remain infectious even if the wet conditions are interrupted by six- to 24-hour dry periods. High relative humidity (~85 per cent) is also favourable for this disease. Interestingly, under moist conditions, a proportion of *Stemphylium* spores will germinate at temperatures as low as 5°C and the spores are capable of producing multiple germ tubes, which may enhance their potential for infection. Upon infection through leaves, the fungus will spread through the plant cells, feeding on the available water and nutrients, and leading to death of the cells and the appearance of symptoms on the plant.

Apparently, *Stemphylium* spp. have found a way to survive the long, cold Saskatchewan winters, spreading and initiating infections through the release of wind-blown and rain-splashed spores from the crop debris in the summer. While infection may lead to seed staining, a decrease in seed size and low germination rates, and the pathogen has been isolated in seed testing laboratories, the significance of seed transmission of stemphylium blight in Saskatchewan is unknown. At this time, there are no fungicides registered for control of stemphylium blight on lentil. While the value of crop rotation should never be downplayed, its effect in this cause may be limited because *Stemphylium* spp. can survive in the absence of a host. Generally, however, when crop residue has been buried or broken down, inoculum levels will be reduced. The best-case scenario for avoiding stemphylium blight will likely be to establish an even, healthy crop that gets off to a good start in the spring, and moves rapidly to harvest with adequate heat and dry weather between rain showers.

Figure 6: Diseased lentils near Davidson, 2009.
Source: Saskatchewan Agriculture

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Rising to the Top: Stemphylium Blight of Lentils
(Continued from page 5)

Other Lentil Disease Issues

In some areas of the province where lentil canopies have been thick and the recent rainfall has created humid conditions and lodging, botrytis grey mould and sclerotinia have also been noticed in addition to stemphylium blight (Figure 6). Clouds of *Botrytis* spores become visible when the crop is disturbed, and appear as a velvety growth covering rotting stems and pods (Figure 7). Sclerotinia stem and pod rot will be identified by the white mould and black sclerotia developed on the outside of the stem (Figure 4). While there are registered fungicides for the control of botrytis grey mould and sclerotinia on lentils, nobody could have predicted that we would need them this year. When planning next year's rotation, however, remember that sclerotinia affects other broadleaf crops, including canola. ✿

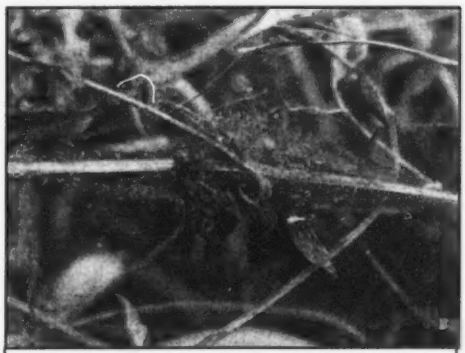

Figure 7: Botrytis grey mould on lentil, 2009
Source: Saskatchewan Agriculture

Watch Out for Late Blight

By Connie Achtymichuk, Provincial Specialist, Vegetable Crops

Take time to check out your solanaceous plants. Late blight (*Phytophthora infestans*) has been identified on tomatoes and potatoes in numerous locations across the province. No infections have been reported on peppers, but they are at risk too. While producers in more-humid climates apply fungicides regularly during the growing season, producers in Saskatchewan normally require only a few applications.

This year is the exception. The cool, humid weather experienced this summer is ideal for the development and spread of late blight.

Figure 8: Late blight on potato.
Source: University of Saskatchewan

Symptoms

Infected stems and leaves often develop water-soaked lesions surrounded by a pale green halo. The lesion can cross the midrib of the leaf. When producing spores, a white cottony growth is often visible on the underside of the lesion. A strong distinctive odour accompanies widespread infection.

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Watch Out for Late Blight

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Infected tubers develop a reddish-brown discolouration just beneath the skin. The infection develops into a dry rot, but secondary infection by bacteria results in a soft rot that can spread rapidly in storage, resulting in substantial decay. On occasion, entire storage units become infested with secondary rot, leaving no marketable tubers.

Tomatoes exhibit the same leaf and stem symptoms as potatoes, but infected fruit exhibits dark firm lesions, usually at the shoulder. The lesion can cause a coppery or bronze finish to the tomato.

Figure 9: Late blight on tomato.
Source: University of Saskatchewan

Prevention

Most of the popular potato varieties are sensitive to late blight. Sources of infection include infected seed and spores drifting in from adjacent diseased fields or cull piles. The late blight spores can be spread long distances by wind and water. A local infection within and between neighbouring fields can be transferred on machinery. Spores fall to the soil and infect the tubers through contact. Heavy rains and/or shallow hills encourage tuber infections. Cull piles should be fed to livestock or buried deep, as infected tubers in the piles can produce infected plants that produce spores.

Once a plant has become infected with late blight, there are no production practices or crop protection products that will cure the infection. **Regular applications of protectant fungicides before the infection has occurred provide the best defence.** The first spray should go on when the plants are six to eight inches high, followed by one or two more sprays prior to row closure in order to protect the lower canopy. A seven-to-10-day spray schedule is commonly practiced after row closure in order to protect new growth. The spray schedule may be shortened to five days if there is excessive pressure. Systemic fungicides that offer protection for longer periods are also available, but they are more expensive.

If you think you have late blight, have an agrologist confirm the diagnosis. The Crop Protection Lab in Regina can assist, if necessary. In large fields, if the infection is localized, the contaminated area along with a buffer could be disced down. If left unchecked, the infection could spread to the rest of the field and also might destroy your neighbours' fields. Inform neighbours of an infection so that they can increase their efforts in preventing the spread of late blight.

Storing infected crops

To prevent spores contaminating potatoes at the time of harvest, ensure that the plant is completely dead before harvesting it. Late blight spores require green living tissue to survive.

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Watch Out for Late Blight
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Fields with late blight should be harvested last to allow infected tubers to break down. This also ensures that potentially troublesome lots are stored near the door of the storage unit in the event that they need to be moved quickly. Sort out all suspect tubers prior to storing the potatoes, and, if at all possible, store the infected lots separately.

Once in storage, the normal curing process should not be followed. Instead, cool the pile as quickly as possible. Provide adequate airflow to dry up any wet areas, and monitor the stored potatoes for hot spots.

10 Tips to Manage Late Blight

1. Always purchase certified seed. Ensure that your supplier has followed an adequate late blight control program.
2. Eliminate cull piles and volunteer plants.
3. Scout your fields weekly for any signs of the disease. Pay particular attention to damp areas such as low spots or sheltered areas.
4. Apply at least one, and preferably two, sprays of fungicide to protect the canopy when the rows start filling in.
5. A seven-to-10-day spray schedule should be followed in a normal year. The interval may be altered depending on weather conditions.
6. If an infected area is found, destroy the spot and a surrounding buffer area. Healthy looking neighbouring plants may simply not be displaying the symptoms yet. Small infection spots may be pulled, bagged and removed from the field.
7. A large, firm hill will increase the distance spores must travel to reach a tuber and will eliminate cracks that act as pathways for infection.
8. Seed piece treatments lessen the risk of transmission of late blight during seed cutting.
9. Late blight is a community disease. Inform neighbours of the presence of the disease to allow them to step up their efforts. Spores can travel a few hundred miles.
10. Always read and follow the label directions and recommended rates for chemicals. Increasing rates does not necessarily translate into extra protection.☼

Midge-Tolerant Wheat Varieties for 2010

By Blaine Recksiedler, Provincial Specialist, Cereal Crops

Four wheat varieties (three Canada Western Red Spring and one Canada Western Extra Strong) with improved tolerance to wheat midge damage were registered in 2007. Unity VB and Goodeve VB, both CWRS varieties, will be available for commercial production in 2010. The other two varieties, Fieldstar VB (CWRS) and Glencross VB (CWES) will be available for commercial production in 2011. The four varieties will be released as varietal blends.
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Midge Tolerant Wheat Varieties for 2010
(Continued from page 8)

The increased tolerance comes from a highly effective single gene called *Sm*1. Tolerance based on an effective single gene is often short-lived due to genetic mutations that occur in the insect population and the high selection pressure that results from a very effective gene in a mono-culture crop situation. To maintain the maximum benefit of the gene, these varieties will be released as varietal blends containing a refuge variety (susceptible wheat variety) to discourage the development of a mutant midge population that could overcome the *Sm*1 gene.

Essentially, the refuge allows sufficient numbers of susceptible midge to survive, ensuring that the midge that overcome the *Sm*1 gene will most likely mate with *Sm*1-susceptible midge. This will help prevent the development of resistant mutations in the midge population.

Based on current literature, the breeders of these lines have recommended that the refuge consist of 10 per cent susceptible wheat. The blended varieties will be released as certified seed. Other crops that use a refuge include *Bt* (insect-tolerant) crops such as corn, potato and cotton. Refuges can be incorporated in rows within the field, as borders around the field, or interspersed throughout the field. Since adult midge do not travel very far between emergence and mating, the interspersed method of refuge will be used in midge-tolerant wheat.

The stability of the composition of these varietal blends is unknown. After several generations, the refuge may decline to a very low frequency, putting the midge-tolerance at risk. Alternatively, the refuge may increase in frequency in some situations and not provide the level of tolerance expected in years of significant midge infestations. Research on the stability of the varietal blend composition is currently underway. Using certified seed will eliminate the uncertainty and ensure that the refuge is within a desired range. Although efforts have been made to find other sources of midge-tolerance, none have been conclusively identified. This highlights the importance of maintaining the efficacy of the *Sm*1 gene.

For more information on wheat midge, see the publications *Wheat Midge* and *Wheat Midge Forecast Map* on the Saskatchewan Agriculture website at www.agriculture.gov.sk.ca/Production (Crop - Insects and then scroll down to the Wheat Midge publications).✿

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The 2009 Forage Crop in Review

By Michel Tremblay, Provincial Specialist, Forage Crops

The Saskatchewan forage crop struggled against numerous hurdles in 2009. Most regions began the growing season late, with cool temperatures slowing development. In some cases, frost damaged growing points, leading to further developmental delays. Dry conditions, beginning in the fall of 2008, prevailed across much of the province in the spring of 2009, further compromising forage production potential.

Late forage development resulted in delayed harvest of much of the hay crop. Most growers chose to delay cutting to allow hay crops to accumulate more tonnage. Significant acreage of first cut hay was being cut into August. Due to the lack of heat and moisture and the late harvest, second cut acreage and yields will be negligible this year.

Forage quality was reduced by the late cutting, and, in some cases, by the rain that fell during harvest. Late cutting increases the fibre content in hay, making it less digestible. Rain leaches nutrients out of hay, and results in increased dry matter losses. Variable weather conditions across regions resulted in forage quality ranging from fair to good.

Table 1. Summary of Saskatchewan hay crop yields and quality, by region, 2009.

Region	Estimated Yield (per cent of Average)	Long-Term Average Yield for Region	Quality
Prince Albert	60-75	1.4 ton/acre	Good
Tisdale	50 to 75	1.5 ton/acre	Good
Watrous	80 +	1.3 ton/acre	Medium
Yorkton	60-70	1.5 ton/acre	Medium
Weyburn	100	1.2 ton/acre	Good
Outlook	50	1.3 ton/acre	Good
Kindersley	50	1.0 ton/acre	Good
North Battleford	70	1.4 ton/acre	Good
Swift Current	50-75	1.2 ton/acre	Good
Moose Jaw	Below average	1.1 ton/acre	Fair to Good

Hay prices trended upward over the period, with good quality hay presently trading at $80 to 110 per ton. Tightening feed supplies since the beginning of the year resulted in prices moving upward from the approximately $70 per ton observed in midwinter of 2009.

Pasture conditions mirrored those of hay fields. Spring growth was slow, keeping cattle off pasture for an extra two to three weeks. However, periodic rains in many regions in July and August allowed pasture to improve somewhat.

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The 2009 Forage Crop in Review
(Continued from page 9)

Forage seed crops struggled with the poor growing conditions as well. Dry conditions early in the season hurt grass species such as timothy, and cool weather delayed development of all species. Presently, little grass seed has been harvested. Some legume fields are still flowering. It appears that a below-average forage seed crop will be harvested this year.

The 2009 forage year was characterized by cold, dry conditions resulting in a delayed, below-average crop. Tightening feed supplies following several years of generally good forage crops increased cost of forage to livestock growers. ✿

Mustard Harvest: Improve Quality through Proper Management

By Venkata Vakulabharanam, Provincial Specialist, Oilseed Crops

Mustard is often a profitable crop choice; however, production is a challenge. Care taken during harvest, handling and storage will affect quality. Mustard buyers and processors have strict quality requirements, and the Canadian Grain Commission has established standards for mustard. In order to produce a high quality crop, mustard producers need to understand the factors that can lead to downgrading a mustard crop. The following table outlines these factors and their associated tolerance levels (example shown for yellow mustard).

Table 2: Domestic yellow mustard seed: primary and export grade determinants.

Grade Name	Standard of Quality		Damage (per cent)		
	Degree of Soundness	Other Classes (per cent)	Distinctly Green	Heated	Total
No. 1 Canada	Reasonably well-matured, sweet, good natural colour	0.5	1.5	0.1	1.5
No. 2 Canada	Fairly well-matured, sweet, reasonably good colour	2.0	1.5	0.2	3.0
No. 3 Canada	May have the natural odour associated with low quality seed, not any odour that would indicate serious deterioration	5.0	3.5	0.5	5.0
No. 4 Canada	May have the natural odour associated with low quality seed, not any odour that would indicate serious deterioration	10.0	3.5	1.0	10.0

Grade Name	Conspicuous inseparable seeds					Other (per cent)			
	Distinctly detrimental (per cent)				Total (per cent)				
	Cow cockle	Sclerotinia	Wild mustard canola/ rapeseed	Total distinctly detrimental		Ergot	Excreta*	Soft earth pellets	Stones
No. 1 Canada	0.1	0.1	0.1	0.1	0.3	0.05	1K	0.01	0.05
No. 2 Canada	0.2	0.2	0.2	0.2	0.5	0.05	1K	0.2	0.05
No. 3 Canada	0.3	0.3	0.3	0.3	0.7	0.05	1K	0.3	0.05
No. 4 Canada	1.0	1.0	1.0	1.0	3.0	0.05	0.005	1.0	0.10

** Number of kernel-sized pieces in 500 g*

Source: Canadian Grain Commission

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Mustard Harvest: Improve Quality through Proper Management
(Continued from page 11)

Here are some crop management tips that can help growers to achieve better quality mustard.

Degree of Soundness and Green Seed – Straight-combining, which allows plants to cure naturally, is an effective way to reduce the number of green seeds and ensure a well-matured, sweet seed with good colour. However, all green seed should be allowed to cure before straight-combining; it will not cure once in the bin. If swathing, begin when the mustard seeds have approximately 25 per cent moisture. Seed will cure in the swath, and the green colour will dissipate only if the moisture level in the seed remains above 20 per cent and the temperature above 5°C.

Excreta (insect parts and waste) – Thoroughly clean harvest and transportation equipment and the storage facility. Grasshopper populations were high in some areas this year, but control measures may keep them away from the combine and their body parts out of the seed. Make sure to follow pre-harvest intervals for registered pesticides for grasshopper control.

Sclerotinia sclerotia – Mustard and many other broadleaf crops and weeds are susceptible to sclerotinia. Follow a sound crop rotation to disrupt the disease cycle, and ensure control in mustard and preceding crops.

Ergot sclerotia – Some cereals are susceptible to ergot infection; ensure that volunteer cereals are controlled if ergot has been a problem in the past. Thoroughly clean harvest and transportation equipment and the storage facility.

Wild mustard, canola/rapeseed – The best method to avoid contamination of mustard with canola is to never plant them on the same piece of land. If this is not possible, allow a minimum of four years between Argentine canola and mustard and six years between Polish canola and mustard. Ensure that wild mustard and volunteer canola plants are controlled in the crops preceding mustard. To start the season right, do not plant mustard seed that is contaminated with either wild mustard or canola seed.

Soft earth pellets/stones – The combine may pick up soft earth pellets and stones in a windrow. It may be a good idea to straight-combine if the crop is short and swathing is near the soil surface. Ensure that storage facilities are free of soft earth pellets and stones.

Heated Seed – If possible, harvest mustard below 10 per cent moisture for short-term storage (less than five months), and below nine per cent moisture for longer-term storage (beyond five months). When auguring into the bin, use a deflector to evenly spread heavier, moist green material and fines away from the core. Aeration will reduce the temperature of stored seed. Mustard stored for a long period should be kept at less than 18°C and below nine per cent moisture. When drying mustard seed, do not exceed 65°C (150°F) air temperature and 45°C (113°F) seed temperature.☼

Pulse Crop Storage

By Dale Risula, Provincial Specialist, Special Crops

To prevent harvest losses and damage, pulses are harvested at moisture levels that are higher than levels considered appropriate for binned storage. Pulse crops must be reduced to 14 per cent moisture content (13 per cent for red lentil) and cooled to less than 15°C. Factors such as immature seeds, green material and weed seeds influence the length of time that the crop can be safely stored, and potentially require lower moisture and temperature combinations as a result.

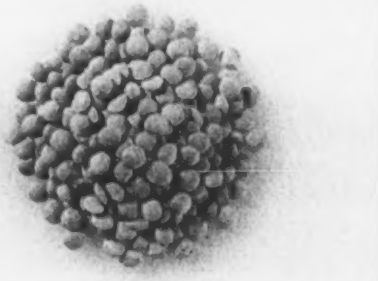

Figure 10: Large Green Lentil Sample.
Source: Saskatchewan Agriculture

When the outside air is warm at harvest, even dry pulses are subject to problems due to grain respiration. Pulse seed continues to respire even after being binned. The higher the temperature and moisture content, the higher the respiration rate. Byproducts of respiration are carbon dioxide, moisture and heat. Deterioration is caused by the accumulation and concentration of moisture and heat within stored grain. Therefore, action must be taken quickly to avoid this problem. Time, temperature and moisture can be controlled to maintain the quality of the crop. Time and temperature are easier to influence than moisture when using aeration systems. Aeration bins help reduce deterioration by cooling grain to an acceptable level, and, under ideal conditions, will help increase storage time.

Knowing the airflow rate (cubic feet per minute per bushel – cfm/bu), the following calculation can be used to determine the time required for one cooling cycle to pass through the grain:

$$\text{Number of hours to cool the grain} = \frac{15}{\text{Air flow rate (cfm/bu)}}$$

Typical airflow rates for aeration systems range from 0.08 to 0.16 cfm/bu. This calculation assumes at least 15 per cent perforated flooring and a grain moisture content within one per cent of dry. The fan should operate for at least one full cooling cycle. Cooling efforts may be relaxed when the grain temperature is within 5°C above the average outside daily air temperature. Any factor that reduces airflow will affect uniformity or time required to cool the grain. For example, levelling the top of the binned grain so that it is not cone shaped will allow more uniform cooling. Watch out for condensation or heat accumulation in the grain during cooling.

Efforts taken to preserve the quality of your pulse crop will help ensure that its value is maintained in the future. ✡